CLAIMS

1. A modular hydraulic turbine comprising :

a cylindrical inlet unit through which water may enter, said inlet unit being made of one piece and having a longitudinal axis, a central cone-shaped hub provided with a central rearwardly opening cavity aligned with the longitudinal axis, and a plurality of incurved blades projecting radially at a same first angle all around said hub;

a tubular outlet unit made of one piece, said outlet unit having a front portion and a rear portion, the front portion being cylindrical in shape and having a longitudinal axis coaxial with the axis of the cylindrical inlet unit, the rear portion extending at an angle relative to the front portion;

means for rigidly connecting the inlet and outlet units to form a bent tubular water tight housing through which water may flow;

a shaft coaxial with said longitudinal axis, said shaft having a front end portion extending at least partially and rotatably into the central cavity of the hub, a central portion extending within the front portion of the outlet unit, and a rear end portion engaging the rear portion of the outlet unit and extending outside said housing;

a casing coaxial with the longitudinal axis and rigidly connected to the outlet unit outside of said outlet unit, said casing comprising sealing means for providing a watertight joint at a spot where the shaft extends outside the housing, and mounting means for rotatably supporting the rear end of said shaft; and

a hollow rotor rigidly connected to the shaft, said rotor being mounted proximate the hub and comprising a central core and a plurality of incurved blades projecting radially outwardly at a same second angle all around the core, said second angle being in a direction opposite to the first angle of the blades of the hub, said rotor causing said shaft to rotate when water flows inside said housing.

2. The modular hydraulic turbine of claim 1, wherein:

the hollow rotor is cone-shaped and define together with the hub an ovoid-shaped member; and

the ovoid-shaped member comprises lubrication means for lubricating the front end portion of the shaft extending into the central cavity of the hub.

3. The modular hydraulic turbine of claim 2, wherein said lubrication means comprises:

an axial hole extending from the rearwardly opening cavity of the hub up to a front exterior surface thereof; and

spacing means connected to said rearwardly opening cavity for providing a gap between the hub and the rotor,

the axial hole, the rearwardly opening cavity and spacing means providing a path wherein water may flows, thereby lubricating and cooling the front end portion of the shaft.

4. The modular hydraulic turbine of claim 1, wherein the inlet unit, the outlet unit, the shaft, the rotor and/or the casing are made of a material selected from the group consisting of stainless steel, plastic materials and aluminum.

5. The modular hydraulic turbine of claim 1, wherein the means for rigidly connecting the inlet and the outlet units comprise socket head fastening bolts.

6. The modular hydraulic turbine of claim 1, wherein the mounting means for rotatively supporting the rear end of the shaft comprises an oil lubricated roller bearing.

7. The modular hydraulic turbine of claim 1, wherein the central rearwardly opening cavity and the front end portion of the shaft extending therein are coated with a plastic coating, said coatings providing a snug fit between said front end portion and said cavity.

8. The combination of a modular hydraulic turbine according to claim 1 with an electric power generator, said generator being operatively connected to the

rear end portion of the shaft outside said housing for producing electric energy upon rotation of said shaft.

9. The combination of a modular hydraulic turbine with an electric power generator according to claim 8, having an electric production capacity of from about 10 kW/h to about 1200 kW/h.

10. The combination of a modular hydraulic turbine with an electric power generator according to claim 9, wherein said electric generator produces about 150 kW/h when water flows inside the housing of the turbine at a flow of about one half cubic meter of water per second.

11. A modular hydraulic turbine comprising :

a cylindrical inlet unit through which water may enter, said inlet unit being made of one piece and having a longitudinal axis, a central cone-shaped hub provided with a central rearwardly opening plastic-coated cavity aligned with said longitudinal axis and a plurality of incurved blades projecting radially at a same first angle all around said hub;

a tubular outlet unit made of one piece, said outlet unit having a front portion and a rear portion, the front portion being cylindrical in shape and having a longitudinal axis coaxial with the axis of the cylindrical inlet unit, the rear portion extending at an angle relative to the front portion;

means comprising socket head fastening bolts for rigidly connecting the inlet and outlet units to form a bent tubular water tight housing through which water may flow;

a shaft coaxial with said longitudinal axis, said shaft having a front end portion coated with a plastic coating and extending at least partially and rotatably into the central cavity of the hub, a central portion extending within the front portion of the outlet unit and a rear end portion engaging the rear portion of the outlet unit and extending outside said housing;

a casing coaxial with the longitudinal axis and rigidly connected to the outlet unit outside of said outlet unit, said casing comprising sealing means for

providing a watertight joint at a spot where the shaft extends outside the housing and mounting means consisting of an oil lubricated bearing for rotatively supporting the rear end of said shaft;

a hollow cone-shaped rotor rigidly connected to the shaft, said rotor being mounted proximate the hub and comprising a central core and a plurality of incurved blades projecting radially outwardly at a same second angle all around the core, said second angle being in a direction opposite to the first angle of the blades of the hub, said rotor and hub defining together an ovoid-shaped member, said rotor causing the shaft allowing said shaft to rotate when water flows inside said housing; and

lubrication means comprising an axial hole extending from the rearwardly opening cavity of the hub up to a front exterior surface thereof, and spacing means connected to said rearwardly opening cavity for providing a gap between the hub and the rotor, said axial hole, rearwardly opening cavity and spacing means providing a path wherein water may flows thereby lubricating and cooling the first end portion of the shaft, the inlet unit, the outlet unit, the shaft, the rotor and/or the casing being made of a material selected from the group consisting of stainless steel, plastic materials and aluminum.

12. The combination of a modular hydraulic turbine according to claim 11 with an electric power generator, said generator being operatively connected to the second end portion of the shaft outside said housing for producing electric energy upon rotation of said shaft.

13. The combination of a modular hydraulic turbine with an electric power generator according to claim 12 having an electric energy production capacity of from about 10 kW/h to about 1200 kW/h.

14. The combination of a modular hydraulic turbine with an electric power generator according to claim 13, wherein said electric generator produces about 150 kW/h when water flows inside the housing of the turbine at a flow of about one half cubic meter of water per second.